



## DEPARTMENT OF COMMERCE

### National Institute of Standards and Technology

#### Robot Workcell Degradation Technology Exploration with the Manufacturing Extension Partnership National Network Consortium

AGENCY: National Institute of Standards and Technology, Department of Commerce.

ACTION: Notice of Research Consortium.

SUMMARY: The National Institute of Standards and Technology (NIST), an agency of the United States Department of Commerce, in support of efforts to verify and validate robot workcell health monitoring methods for use in the manufacturing industry, is establishing the Robot Workcell Degradation Technology Exploration with the Manufacturing Extension Partnership National Network Consortium (“Consortium”). In addition to supporting verification and validation of robot workcell health monitoring methods, the consortium intends to provide NIST with the opportunity to transfer technology to the U.S. manufacturing sector through the Manufacturing Extension Partnership (MEP) National Network™.

DATES: The Consortium's activities will commence on July 23<sup>rd</sup>, 2021 (“Commencement Date”). NIST will accept letters of interest from MEP Center teams to participate in this Consortium from prospective participants until December 1, 2023.

ADDRESSES: Completed letters of interest or requests for additional information about the Consortium can be directed via electronic mail to RobotCRADA@nist.gov.

FOR FURTHER INFORMATION CONTACT: J’aime Maynard, CRADA Administrator, National Institute of Standards and Technology's Technology Partnerships Office, by mail to 100 Bureau Drive, Mail Stop 2200, Gaithersburg, Maryland 20899, by electronic mail to Jaime.maynard@nist.gov, or by telephone at (301) 975-8408.

SUPPLEMENTARY INFORMATION: Consortium efforts are expected to yield practical lessons learned and guidance on the deployment and usage of the NIST-developed test methodology and companion sensor along with producing quantitative data from the test method and the host robot workcells. This will enhance NIST’s research verifying and validating methods to assess robot workcell health degradation in addition to accelerating technology transfer into the manufacturing industry.

NIST’s Engineering Laboratory has developed a test method – Identification and Isolation of Robot Workcell Degradation – that has the potential to efficiently assess the change in accuracy within a robot workcell, including those used in manufacturing operations. The test method is paired with the NIST-developed Position Verification Sensor (PVS – patent pending) to yield pass/fail output when the test method is executed with the PVS in a robot workcell. The test method and PVS are designed such that the change in accuracy of the key insertion can be measured to desired tolerances. This capability addresses the challenge that it can be costly to determine if the health of a robot workcell has degraded before quality and/or productivity are

impacted. The test method and sensor require verification and validation from industrial partners. The Manufacturing Extension Partnership (MEP) National Network<sup>TM</sup>, a public-private partnership with Centers in every U.S. state and Puerto Rico dedicated to serving small and medium-sized manufacturers, is uniquely positioned to enable this activity.

Each pilot study will be performed at a MEP Center-selected manufacturing facility. Proof of concept studies, prior to individual pilot studies, may be conducted at an MEP Center or at a chosen technology integrator/builder facility.

This CRADA Consortium involves the use of U.S. Government IP. NIST Invention entitled “POSITION VERIFICATION SENSOR WITH DISCRETE OUTPUT”, US Patent Application 16/572,847, filed on September 17, 2019, will be the IP that is used in this collaboration.

This Consortium has specific objectives including:

- 1) Pilot the test method and PVS in manufacturing facilities through guided deployments by state-based MEP Center teams to obtain practical feedback, including quantitative performance data, lessons learned, and deployment guidance, regarding the viability of the test method and sensor in robot workcells;
- 2) During each pilot study, obtain information regarding the manufacturing operations, test method, and sensor performance including a) data from the test method and sensor during its usage in a robot workcell health testing, b) component-level data from the robot(s) that are interacting with the sensor, c) process-level data captured from the overall workcell(s) that include the test method/sensor, d) operational configuration information of the robot workcell including use case variants (e.g., robot picks up boxes weighing 5 kg and 10 kg as opposed to picking up boxes of the same weight), e) maintenance logs and activities that document faults and failures of the workcell along with specific maintenance that is performed, and f)

feedback from manufacturing personnel (e.g., operators, maintenance personnel, plant managers, etc.);

- 3) Enable MEP Center teams to explore the development of a service of the NIST test method and/or the commercialization of the new sensor technology to ultimately promote transfer to the manufacturing industry; and
- 4) Enable MEP Center teams to promote a capability for manufacturers/robot workcell end-users to detect degradation of process accuracy prior to it impacting product quality or operational productivity

There are numerous potential benefits to the participating MEP Center teams including:

- a. Acquisition of a research license of NIST's PVS technology to practice the invention to explore its commercial feasibility
- b. Feedback on the deployment, integration, usage, and maintenance (as necessary) of the sensor within relevant operational environments to determine if/where/how to make the technology more viable for commercialization
- c. Identification of the use cases and scenarios that the sensor and test method can be reasonably deployed
- d. Acquire advanced knowledge of potential degradations to process accuracy prior to degradations negatively impacting product quality or operational productivity
- e. If the sensor became commercially available, this could lead to the development of services using the sensor to improve the operations and efficiency of small and medium manufacturers.

*Participation Process:*

Eligibility will be determined by NIST based on the information provided by prospective participants in response to this notice on a first-come, first-serve basis. In accordance with the Consortium objectives, collaborators must be MEP Centers. Collaborator project teams must be entirely composed of MEP Centers or, if a project team includes non-MEP Center team members, the project team must be led by an MEP Center Collaborator. All participants will be required to sign the Cooperative Research and Development Agreement (CRADA) for this Consortium, and each participant will be bound to the same terms and conditions in consideration of participation in the Consortium. Participants will not be required to contribute any funds or pay any fee. NIST will evaluate the submitted responses from prospective participants to determine eligibility to participate in this Consortium. Prospective participants should provide a Letter of Interest with the following information to NIST's Consortium Manager:

- (1) A description of the MEP Center team's technical experience in integrating robot workcells and/or sensor technology into manufacturing facilities.
- (2) A description of the manufacturing use cases and deployments of robotic workcells that the MEP Center team would target for NIST test method and PVS deployment.
- (3) A description of services, if any, that the MEP Center team has provided in the domains of robotic manufacturing, predictive maintenance, or sensors.
- (4) List of interested MEP Center's anticipated team members.

Letter of interest must not include business proprietary information. NIST will not treat any information provided in response to this Notice as proprietary information. NIST will notify each

organization of its eligibility. NIST does not guarantee participation in the Consortium to any organization submitting a Letter of interest.

Alicia Chambers,

NIST Executive Secretariat.

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